INVESTIGATIONS OF MEDIUM WAVELENGTH MAGNETIC ANOMALIES IN THE EASTERN PACIFIC USING MAGSAT DATA

Christopher G. A. Harrison
University of Miami
Rosenstiel School of Marine & Atmospheric Science
4600 Rickenbacker Causeway
Miami, Florida 33149

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During the final quarter of 1981 work was completed on our ideas concerning spherical harmonic modelling of the Earth's magnetic field and the use of such models in removing core produced magnetic fields from magnetic fields of crustal origin.

We have shown that the terms of a spherical harmonic expansion do not uniquely determine a given wavelength of signal as the terms in a Fourier Series do. Addition of terms of higher degree and order to a spherical harmonic expansion tend to fine tune the amplitude of the terms of lower degree and order. As a result, removal of a spherical harmonic model from a regional data set will not remove long wavelengths completely. There will always be core produced magnetic field components in data sets processed in this manner.

These ideas formed the basis of a talk presented at the Fall AGU meeting in San Francisco (copy of abstract enclosed) and a paper currently under review for publication in "Geophysical Research Letters".

We have also been working on a paper to be presented at a meeting at the Royal Society, London, using some data generated by MAGSAT. This paper will also be published by the Royal Society.

Work has continued on a comparison bwtween the data sent to us by Dr. Langel which was used to generate the MAGSAT magnetic anomaly map, and the raw data passed to us in the Investigator tapes. When we have finished this comparison, we shall start on inversions of the data to obtain magnetization estimates for the oceanic crust for different parts of the ocean basins.

TOTAL MAGNETIC FIELD POWER SPECTRA

H.M. Carle
C.G.A. Harrison (both at Rosensteil School of Marine & Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Fla. 33149)

The spectral characteristics of total field profiles encircling the Earth, and generated from the MAGSAT spherical harmonic field model are examined. If total field values are used, the simple pattern which might be predicted is masked by the operation of obtaining vector magnitude from scalar potential. This magnitude is the square root of the sum of the squares of three space differentials of the scalar potential. Each of these differentials can be expressed as a finite sum of various harmonics of the fundamental wavelength, the circumference of the Earth. The squares of the differentials, & also their sums, have a finite number of harmonics, but when the square root is taken, the resulting expression has an infinite number of harmonic terms. We therefore suggest that if spectra of regional field anomalies along profiles are to be taken, the best way of deriving the anomalous data is to take the squared total field and subtract the squared field derived from the spherical harmonic representation of the core field.

Another important result of this work is that the anomalous field will contain significant power in all wavelengths from DC to higher harmonics. In other words, the removal of a core field produced by spherical harmonic coefficients up to a certain degree and order does not necessarily remove all long wavelength components from the anomalous field. This may have implications for the way in which core fields are removed from total field data.

1. Fall meeting, 1981
2. HARR000260
3. C.G.A. Harrison
   RSMAS
   4600 Rickenbacker Causeway
   Miami, Florida, 33149
4. GP
5. None
6. 0
7. 0%
8. As Above
9. C